



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/689,042

10/21/2003

Bakul Patel

60937-0152-US

4500

9629

7590

04/12/2006

MORGAN LEWIS & BOCKIUS LLP  
1111 PENNSYLVANIA AVENUE NW  
WASHINGTON, DC 20004

EXAMINER

ALANKO, ANITA KAREN

ART UNIT

PAPER NUMBER

1765

DATE MAILED: 04/12/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/689,042

Applicant(s)

PATEL ET AL.

Examiner

Anita K. Alanko

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 2/6/06 amdt.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 8-19 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 8-19 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

***Election/Restrictions***

Examiner has allowed for a shift in invention, as requested by applicant in the telephone interview of January 6, 2006, and noted by examiner in the interview summary form mailed on March 1, 2006. The restriction requirement mailed with the office action on 10/6/05 is hereby withdrawn.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter that the applicant regards as his invention.

Claims 8-19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 8, line 7, the term "relatively small" is a relative term. Is less Al, Cu or AlCu alloy removed compared to the amount of TiW alloy and residues? Claims 9-11 are not rejected since the term is defined in these claims. Claims 12-13 do not cure the indefiniteness of their base claims, and are therefore also rejected.

In claim 14, line 5, the term "substantially" is a relative term. It has not been clearly defined in the specification or in the prior art, and therefore the metes and bounds of the claim are unclear. It may be simply deleted.

Claim 14 depends on a cancelled claim. For the purposes of the rejection, claim 14 is treated as citing claim 1 (before it was cancelled) in the body of the claim (in analogous fashion to claim 8). This also means that claim 18 fails to further limit the base claim.

Claims 15-17 and 19 fail to cure the indefiniteness of their base claim, and are therefore also rejected.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 8-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Scherber et al (US 5,858,813) in view of Wang et al (US 6,569,349 B1).

Scherber discloses a method comprising:

polishing a TiW layer (col.10, lines 15-20) with a composition comprising water (col.6, lines 29-35) and from about 0.5%-15% by weight of periodic acid (col.5, line 8, 32-34; the range encompasses the cited range) for a time and a temperature sufficient to cause the composition to remove at least a portion of the TiW alloy.

Scherber does not explicitly how the TiW barrier layer polishing step is used in combination with other steps, such as etching to form a residue and cleaning afterwards. However, these steps are suggested. For example, Scherber teaches that typically a first layer is planarized to expose the surface of a non-planar second layer (col.1, lines 35-37).

Wang teaches a method that gives more specific examples of the method disclosed by Scherber, i.e. CMP/polishing a copper layer selectively to a barrier/TiW layer (col.6, lines 49-52) with a first slurry (col.8, lines 9-13), and then removing the barrier/TiW layer with a second

selective slurry (col.8, lines 20-25). This encompasses the cited steps of providing a substrate comprising an exposed TiW alloy layer and etching the TiW alloy by a method which results in formation of etching residue. Residues are inherent in the etching process since the same method steps are conducted as in the instant invention.

It would have been obvious to one with ordinary skill in the art to provide a substrate comprising an exposed TiW alloy layer and etching the TiW alloy by a method which results in formation of etching residue in the method of Scherber because Wang teaches that this is a useful technique for planarizing substrates to enable ULSI.

Scherber does not explicitly disclose the pH of the composition, however since it comprises an acid, it is expected to be acidic. Wang also teaches that it is useful to vary the pH according to what is being polished (col.6, lines 10-17).

It would have also been obvious to use the composition at a pH of less than about 7 because Wang teaches that it is useful to vary the pH, and thus the pH appears to reflect a result-effective variable that can be optimized. See MPEP 2144.05 IIB.

Since the composition of Scherber is the same as the instant invention, the modified method of Scherber inherently has the same results of relatively small amounts of copper or copper alloy being removed since the same method steps are conducted as in the instant invention.

It would have been still further obvious to rinse the substrate in the modified method of Scherber in order to provide for a clean product, which improves the yield of the final product.

As to claims 9-11, since the composition of Scherber is the same as in the instant invention, it is expected to have the same selectivity.

As to claims 12-13, it is well known that the temperature affects the reaction rate, therefore it would have been obvious to use the compositions at the temperatures cited because the temperature appears to reflect a result-effective variable that can be optimized. See MPEP 2144.05 IIB.

As to claim 14, Wang teaches that solutions that comprise hydrogen peroxide (col.5, lines 65-67) are conventional in CMP solutions. It would have been obvious to one with ordinary skill in the art to use hydrogen peroxide in the modified method of Scherer because Wang teaches that this is a useful, conventional solution for CMP.

As to claims 15-19, see the rejection of claims 9-13.

#### ***Response to Amendment***

The rejection over Garcia is withdrawn in view of the cancellation of claims 1-7. Claims 8-19 are rejected under 35 USC 112, 2<sup>nd</sup> paragraph. The claims are also rejected over newly cited Scherber et al and Wang et al. Scherber discloses CMP of TiW with periodic acid.

#### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The cited art shows CMP with periodic acid. Streinz is cited to show CMP of Ti and W layers. Ma is cited to show CMP with hydrogen peroxide and a periodate salt; a first copper slurry and a second Ti alloy or W alloy slurry. Sinha is cited to show CMP of Cu and W-containing barrier layers with iodic acid and hydrogen peroxide. Ohno is cited to show CMP of W with periodic acid. Small '444 is cited to show CMP with less than 3% periodic acid. Chelle

Art Unit: 1765

---

is cited to show polishing TiW with peroxide and periodic acid. Small '689 shows CMP of W with periodic acid. Mace claims polishing of Ti and W with iodic acid. Nojo shows CMP of W with less than 0.8% periodic acid. Jernakoff is cited to show a W slurry with periodic acid.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anita K. Alanko whose telephone number is 571-272-1458. The examiner can normally be reached on Mon-Fri until 2:30 pm (Wed until 11:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

*Anita K. Alanko*  
Anita K Alanko  
Primary Examiner  
Art Unit 1765